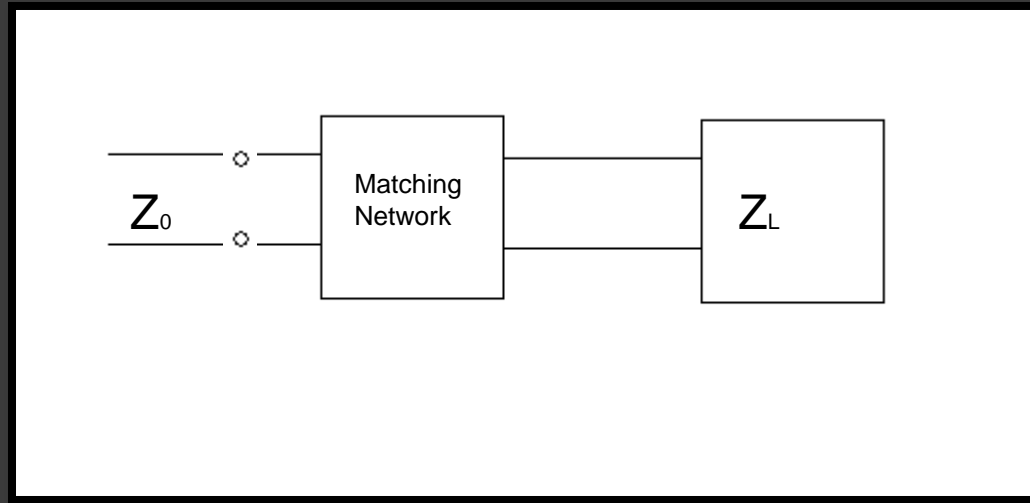


Impedance Matching (Tuning)

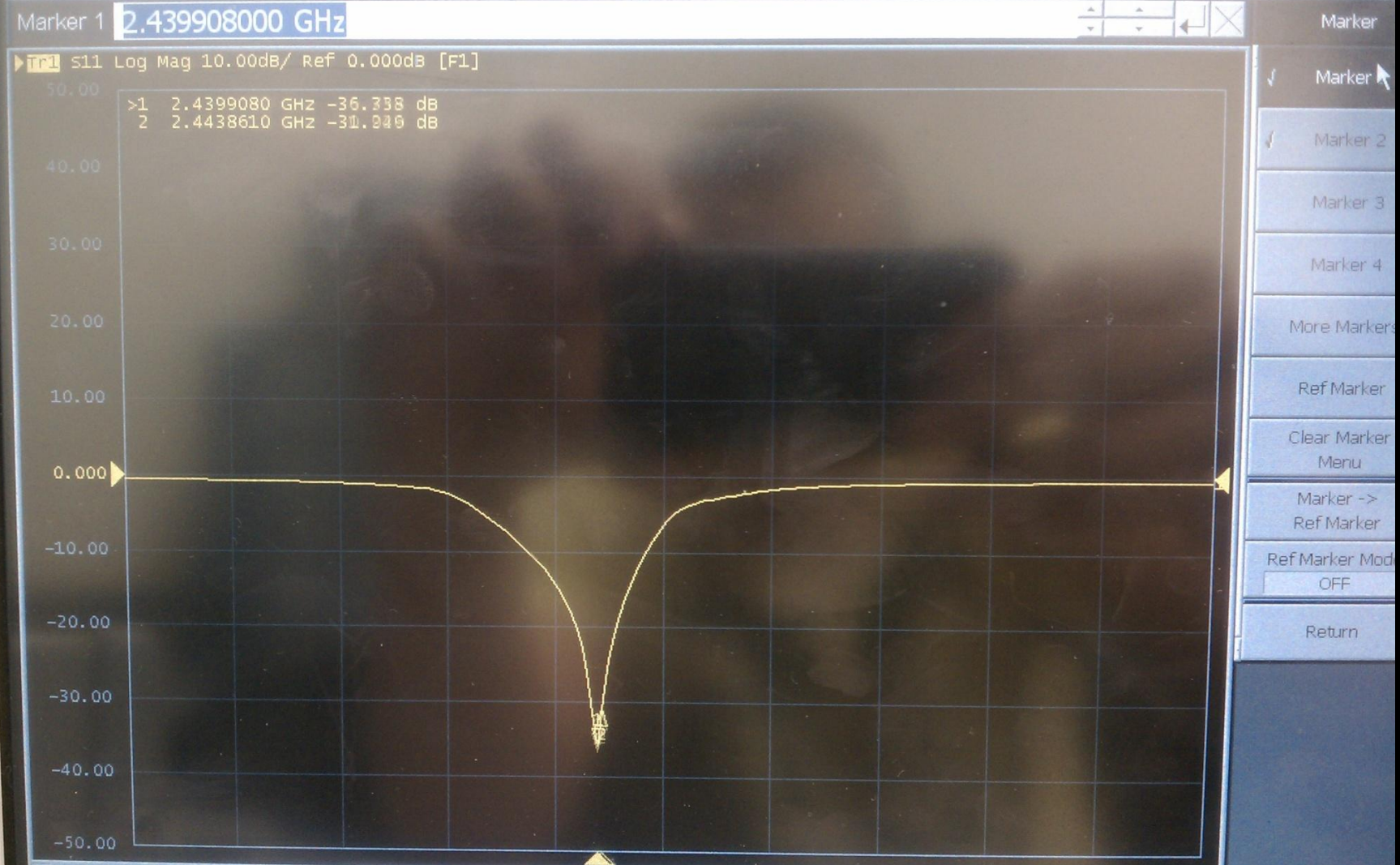


Impedance Matching (Tuning)

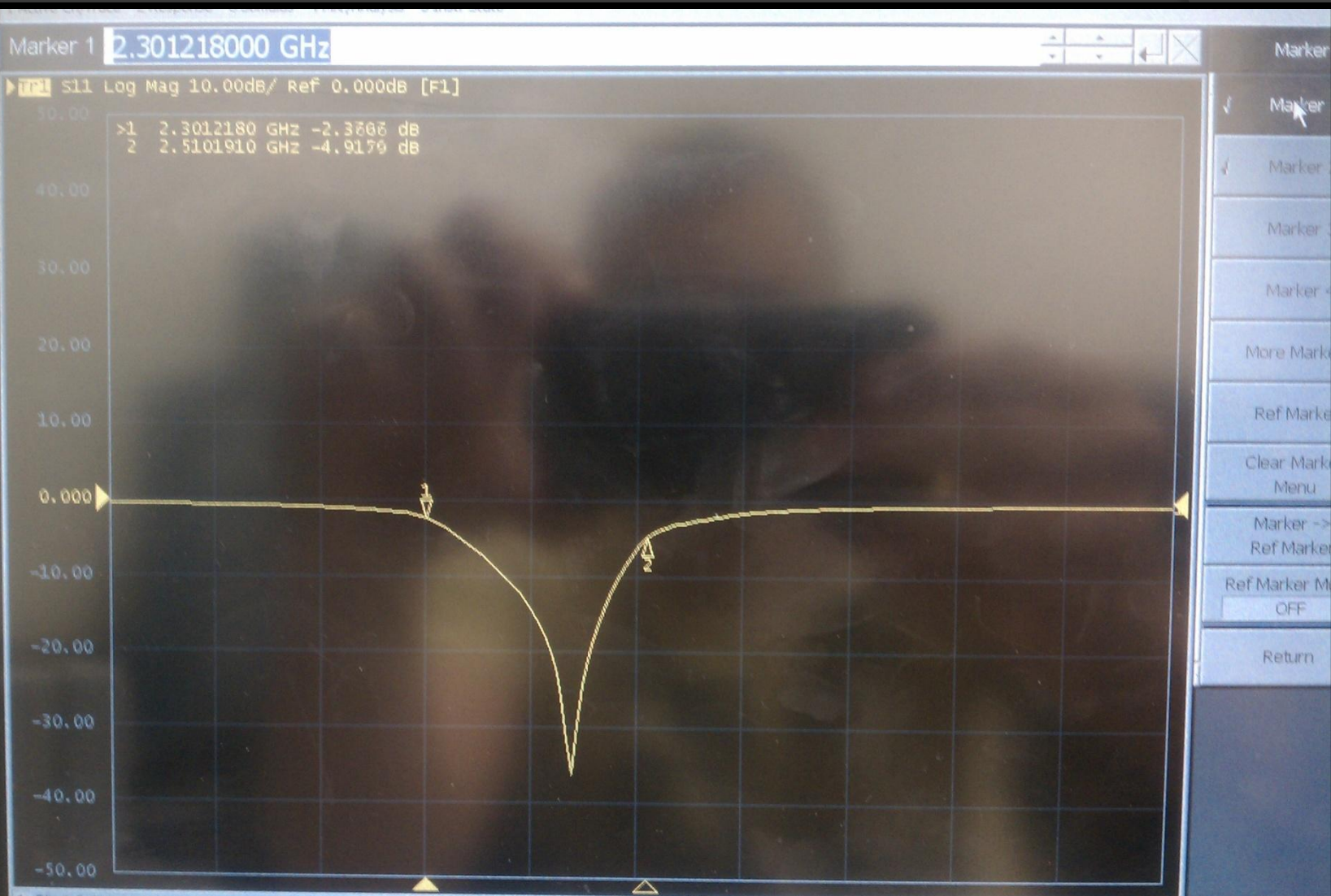
PROTO #2				
PI Network			Center Freq	dB
Trace to GND (doubler side)	Trace in Series	Trace to GND (antenna side)	(GHz)	
11nH	3pF	5pF	2.1	-12.3
11nH	3pF	open	2.094	-15
11nH	3pF	20pF	2.1	-15
11nH	1pF	20pF	2.115	-20.6
11nH	short	20pF	2.096	-9.9
11nH	0.1pF	20pF	2.317	-23
11nH	0.1pF	open	2.28	-18.3
11nH	0.1pF	100pF	2.317	-20
open	0.1pF	100pF	2.2266	-11.2
33nH	0.1pF	100pF	2.86	-11.2
20pF	0.1pF	100pF	2.094	-9.86
1pF	0.1pF	100pF	2.1	-24
1pF	0.1pF	1pF	2.1	-16.62
5.5nH (11//11)	0.1pF	100pF	2.679/2.347	-11.1/-7.56
8.25nH (11//33)	0.1pF	100pF	2.326	-17.4
5.5nH (11//11)	0.1pF	100pF		
5.5nH (11//11)	6pF	100pF	2.1	-9.8
5.5nH (11//11)	0.5pF	100pF	2.824	-9.7
5.1nH	0.5pF	100pF	2.685/2.349	-13/-9.8
3nH	0.5pF	100pF	2.707	-25.3
3.9nH	0.5pF	100pF	2.696	-18.7
1nH	0.5pF	100pF	2.098	-11.1
8.2nH	0.5pF	100pF	2.329	-37.5
6.2nH	0.5pF	100pF	2.351	-10.97
2nH	0.5pF	100pF	2.718	-10.9
0.6nH	0.5pF	100pF	2.101/2.3996	-9.61/-5.46
5nH	0.1pF	100pF	2.355/2.683	-8.5/-11.4
3nH	0.1pF	100pF	2.707/2.373	-24.6/-6.2
8.2nH	0.1pF	100pF	2.333/2.656	-22.5/-8.1
8.2nH	0.1pF	open	2.289	-27
3.9nH	0.1pF	open	2.306	-25.7
2nH	0.1pF	open	2.311	-24
2nH	0.5pF	open	2.092	-10.9
1nH	0.1pF	open	2.313	-19.4
1nH	0.1pF	8.2nH	2.373	-15.9
1nH	0.1pF	3.9nH	2.3886	-7.18
1nH	0.1pF	2nH	2.393	-5.9
8.2nH	0.1pF	2nH	2.327	-12.6
8.2nH	6pF	2nH	2.45	-5.5
8.2nH	0.5pF	2nH	2.329	-13.3
8.2nH	1pF	2nH	2.114/2.74/2.45	-16.6/-19.65/-5.9

8.2nH	1pF	0.6nH	2.041	-22.5
0.6nH	1pF	8.2nH	2.185/2.758	-24.4/-21.8
0.6nH	1pF	2nH	2.185/2.758	-22.2/-21.4
0.6nH	2pF	2nH	2.108	-25.7
3nH	2pF	2nH	2.108	-22.4
3nH	0.1pF	2nH	2.38	-6.8
3nH	0.1pF	5.1nH	2.373	-13.25
3nH	short	5.1nH	2.103	-18.9
3nH	open	5.1nH	2.38	-8.4
8.2nH	open	5.1nH	2.39	-7.8
33nH	open	5.1nH	2.616	-6.5
open	open	5.1nH	2.6	-5.8
24nH	open	5.1nH	2.63	-6.7
24nH	open	100pF	2.3/2.62	-6.6/-6.3
24nH	open	open	2.57	-12.2
open	open	open	2.52/2.45	-11.3/-4.4
open	open	8.2nH	2.9	-14.2
open	8.2nH	open	2.1	-15.2
open	5.1nH	open	2.09	-26
open	5.1nH	8pF	2.384/2.687	-7.5/-16
open	5.1nH	20pF	2.382/2.685	-7.68/-14.8
open	5.1nH	0.5pF	2.397/2.74	-9.36/-17.5
open	2nH	0.5pF	2.417/2.786	-6.79/-6.9
open	8.2nH	0.5pF	2.369	-23.1
3.9nH	8.2nH	0.5pF	2.45/2.342/2.72	-4.7/-10.9/-20.7
3.9nH	0.6nH	0.5pF	2.543	-21
8.2nH	0.6nH	0.5pF	2.428	-16
6.2nH	0.6nH	0.5pF	BAD!!!	
11nH	0.6nH	0.5pF	BAD!!!	same as 8.2 but -4 insertion
24nH	0.6nH	0.5pF	BAD!!!	
11 24 nH	0.6nH	0.5pF	2.444/2.45	-9.9/-7.7
11 24 nH	0.6nH	5pF	BAD!!!	
11 24 nH	0.6nH	0.1pF	BAD!!!	
11 24 nH	0.6nH	0.1 0.1 pF	BAD!!!	
11 24 nH	0.6nH	1pF	BAD!!!	
11 24 nH	0.6nH	0.5pF	2.45	-7.76
11 24 nH	1nH	0.5pF	2.44	-6.76
11 24 nH	0.6nH	0.5pF	2.45	-7.5

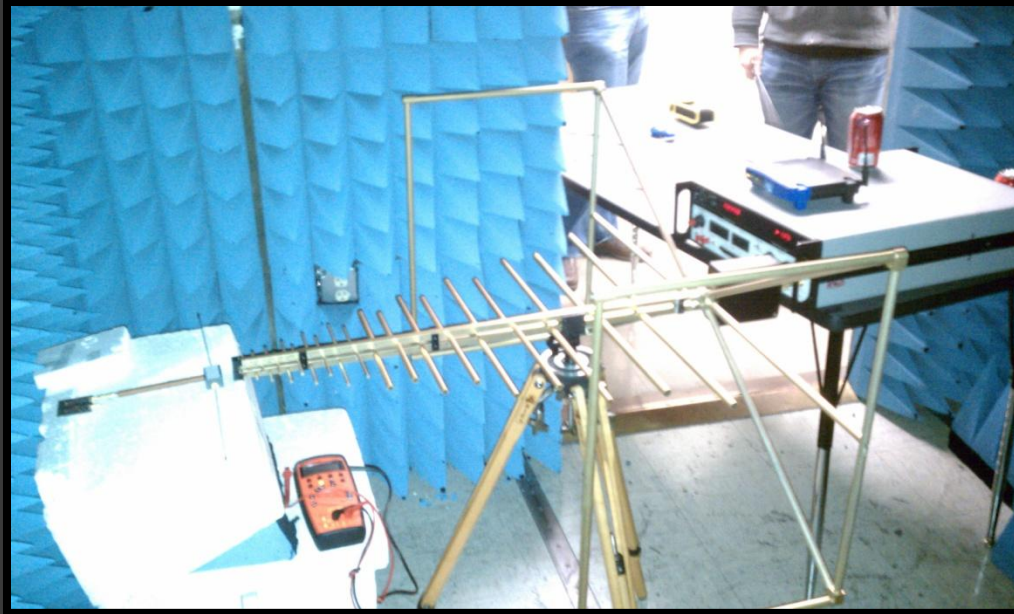
Trial and Error Results (Center Frequency)



Trial and Error Results (Bandwith)

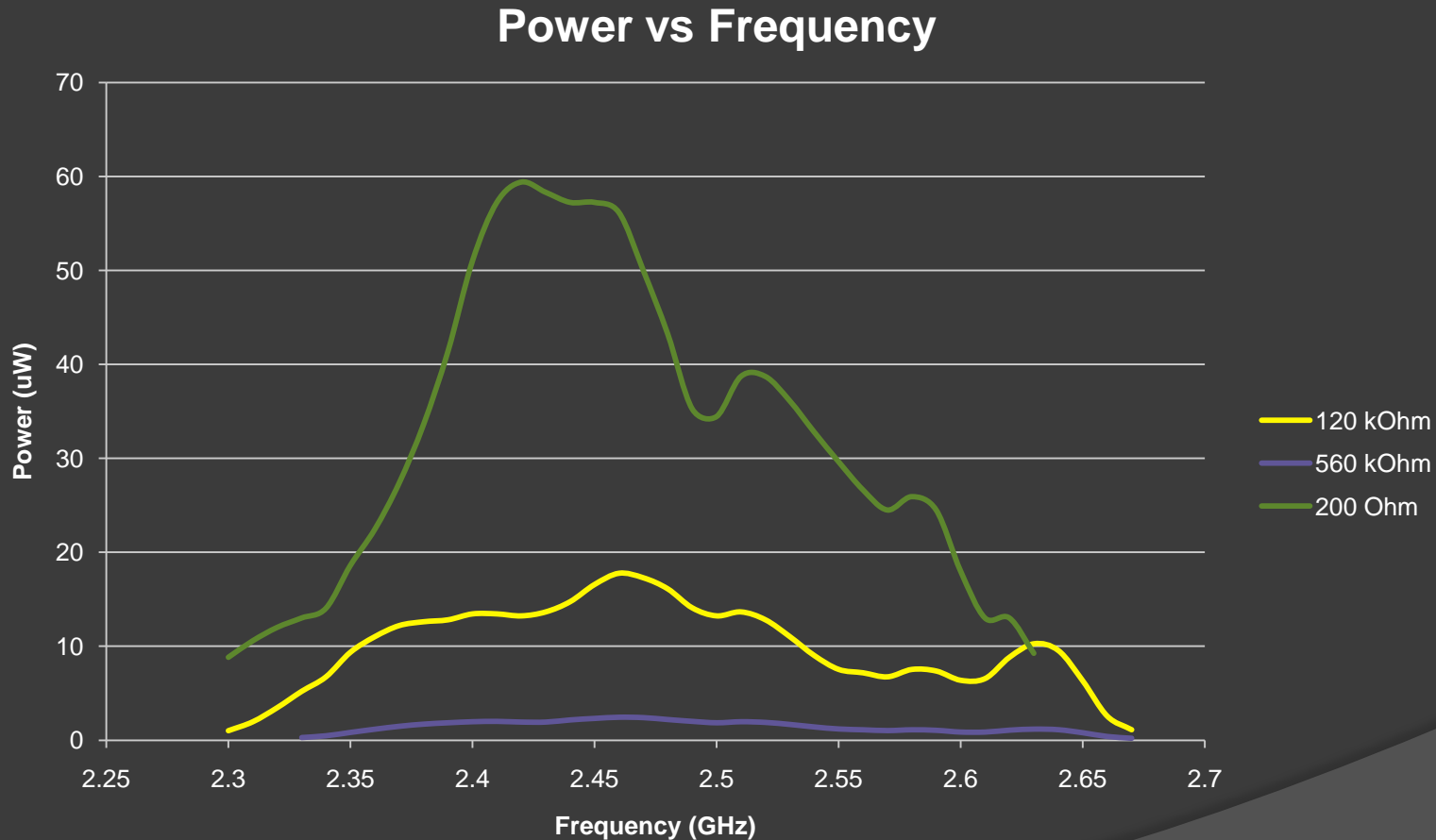


Project Blitzkrieg



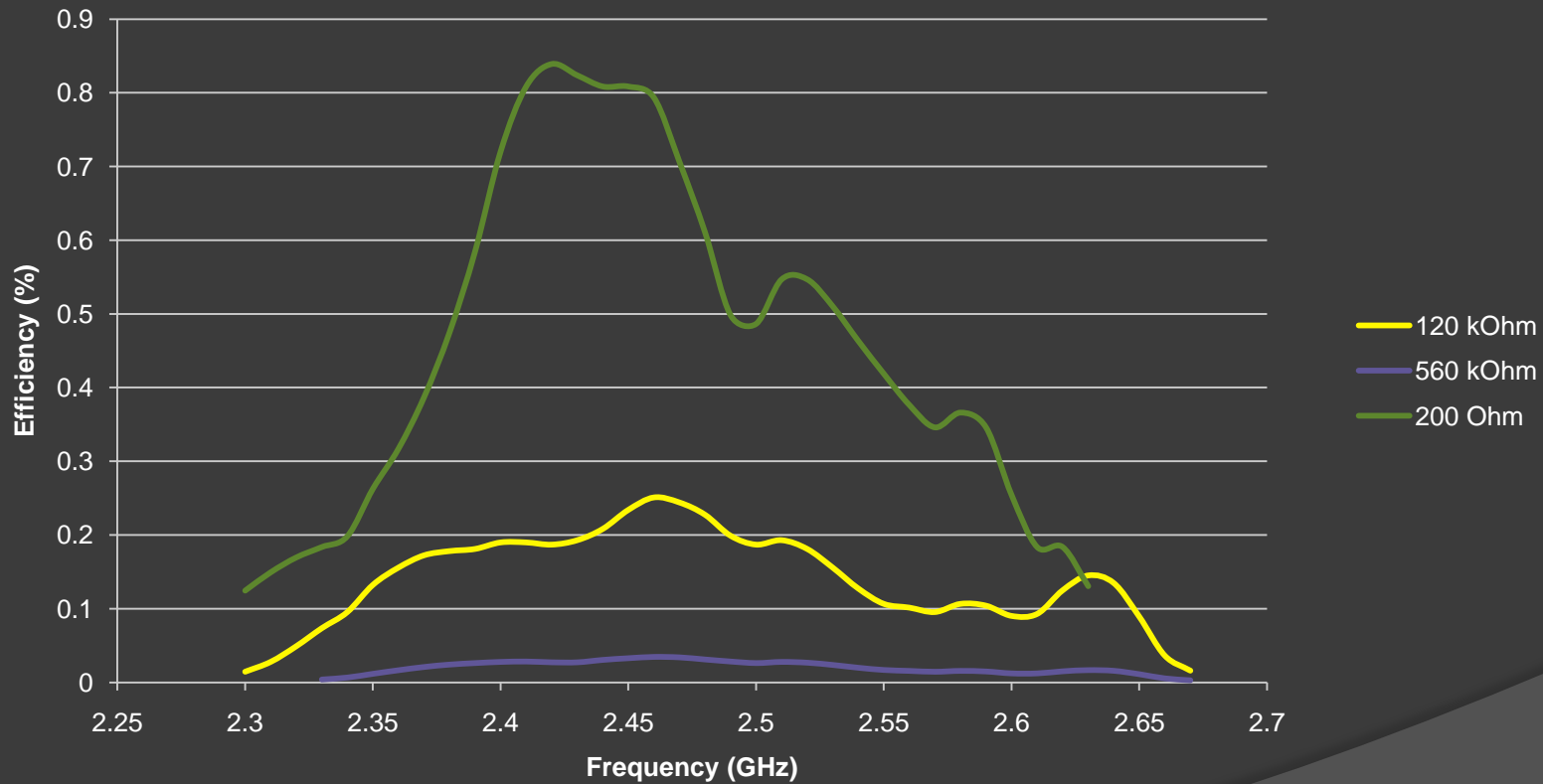
- Nearly 100 hours spent in the lab over a three day period
- Accomplished all testing
- Ate a lot of pizza

Frequency Centered at 2.45 GHz



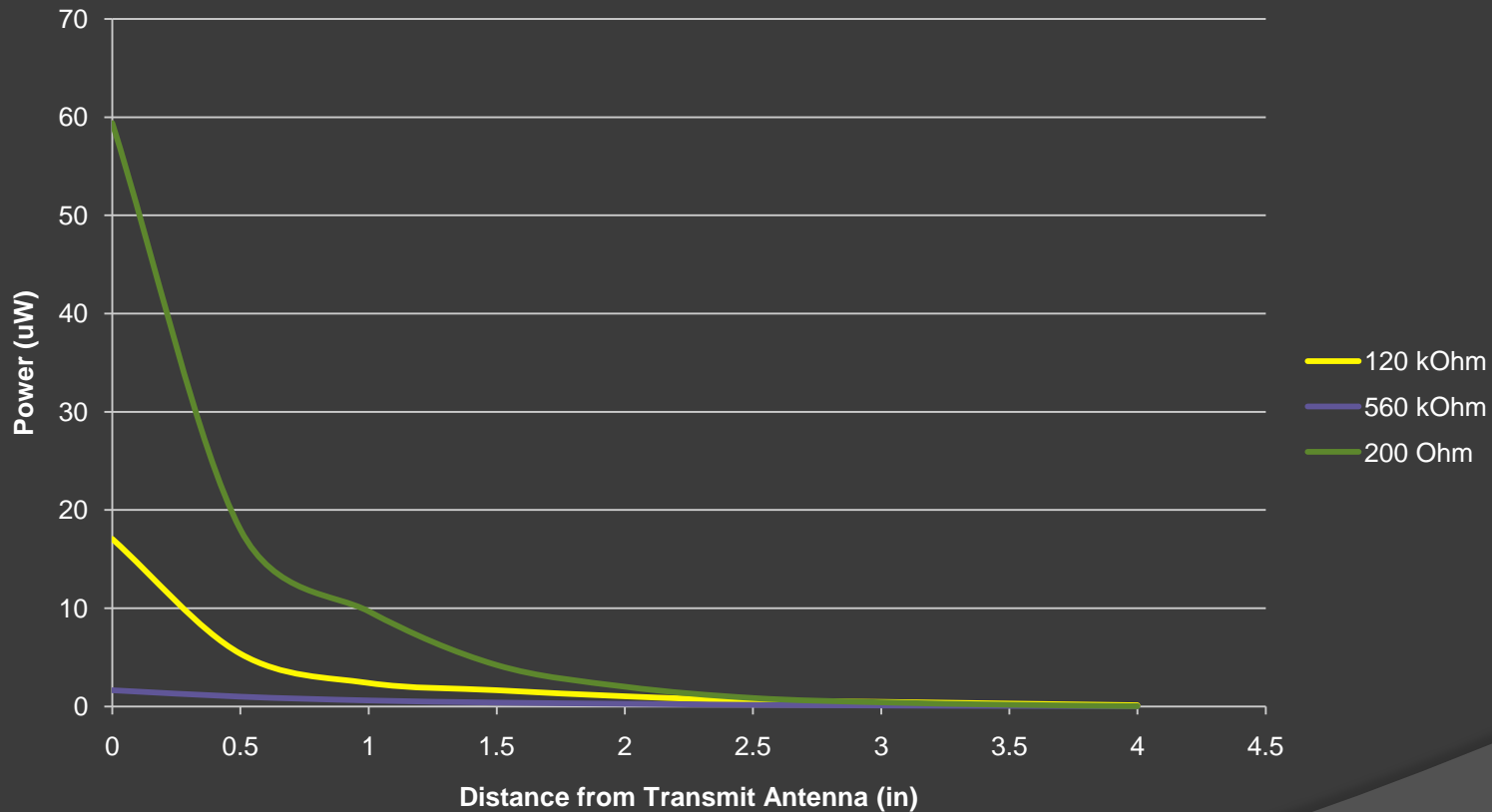
Load Dependency

Efficiency vs Frequency

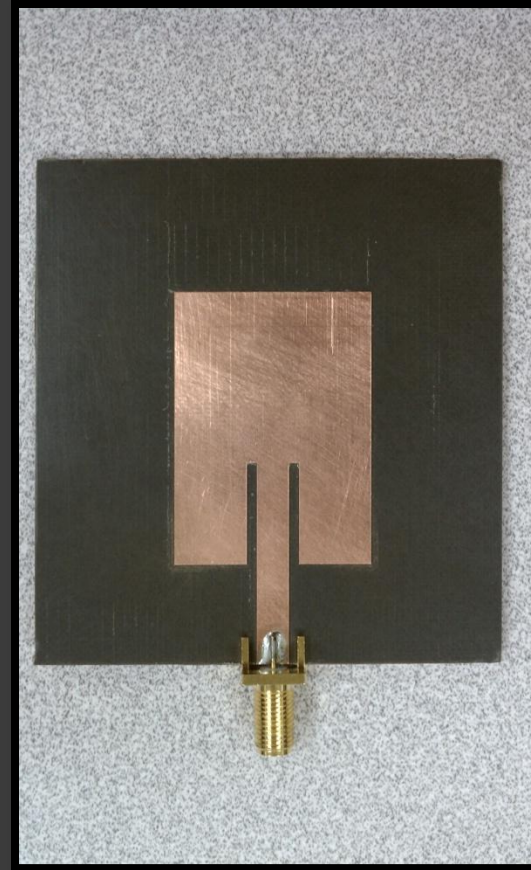
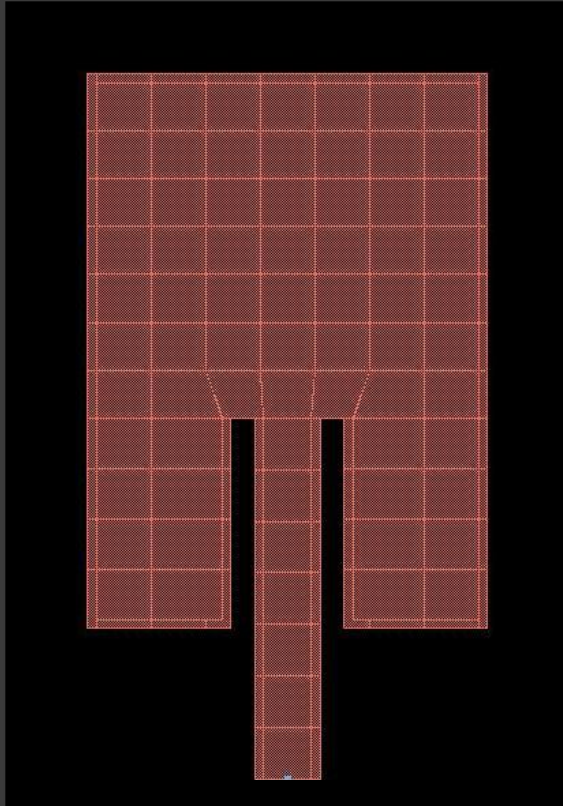


Distance Testing

Power vs Distance

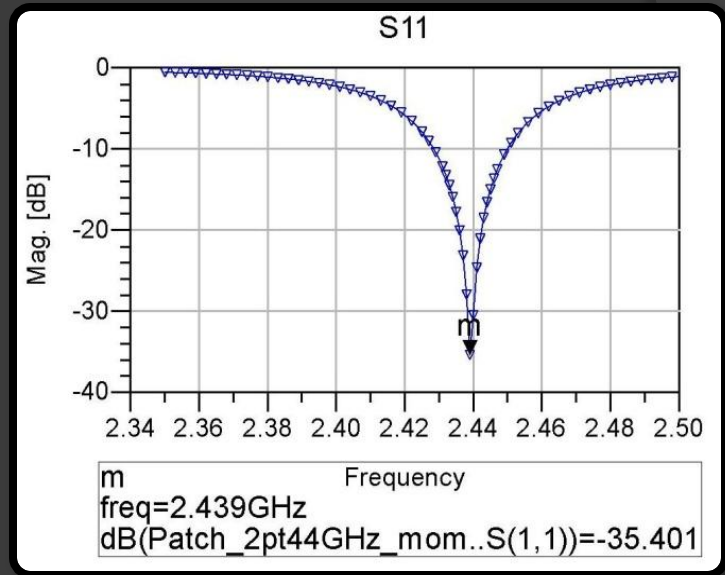
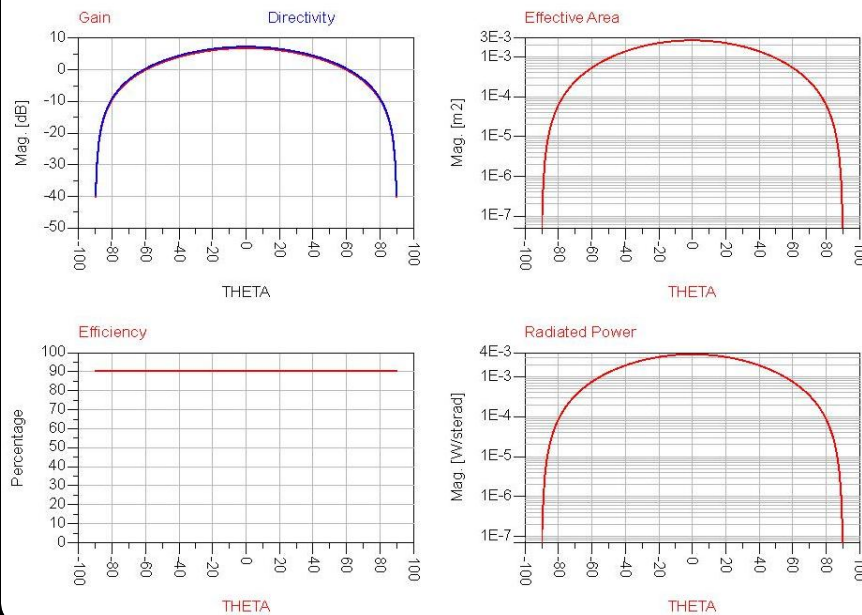


Lommentenna



Lommentenna

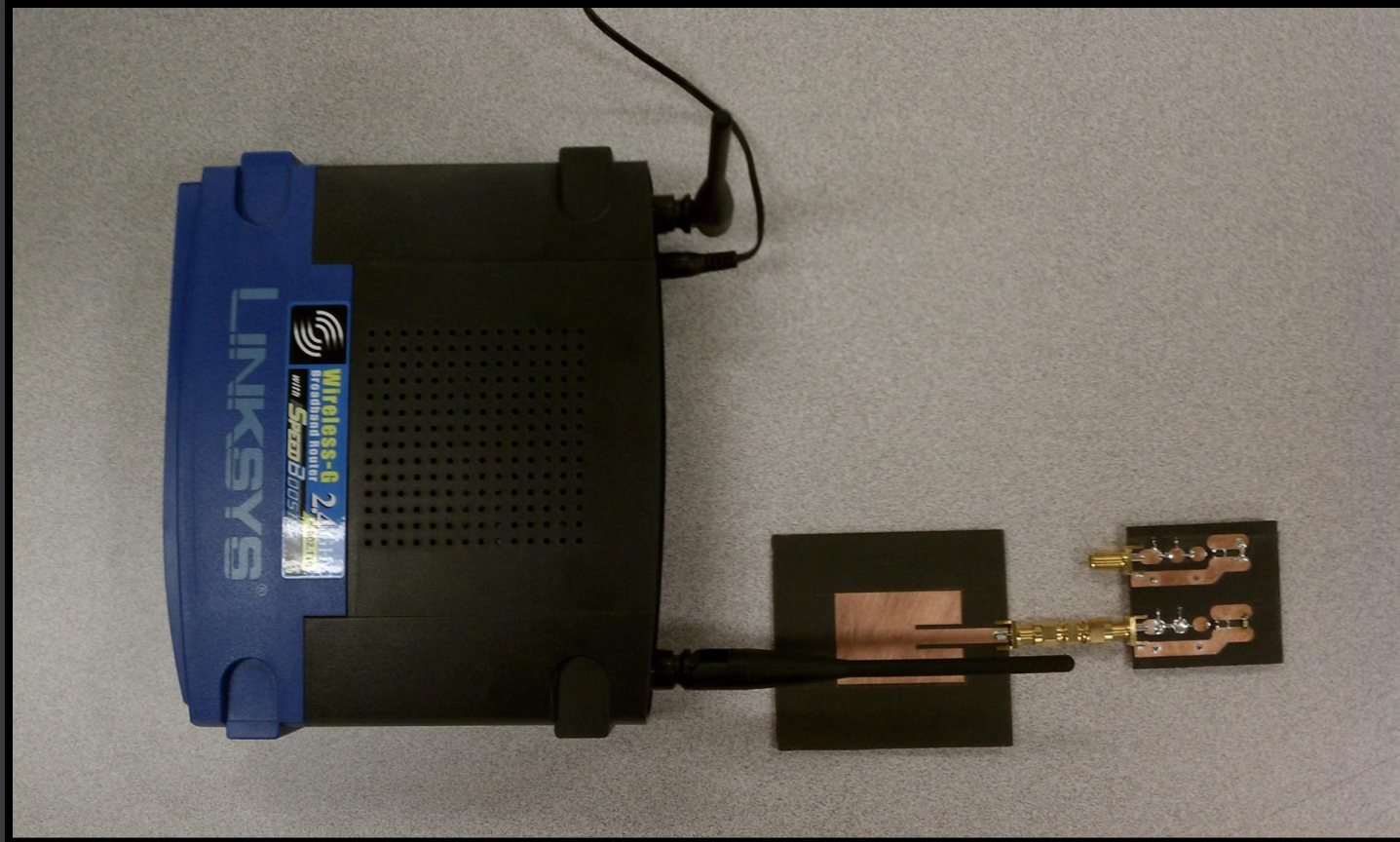
Power



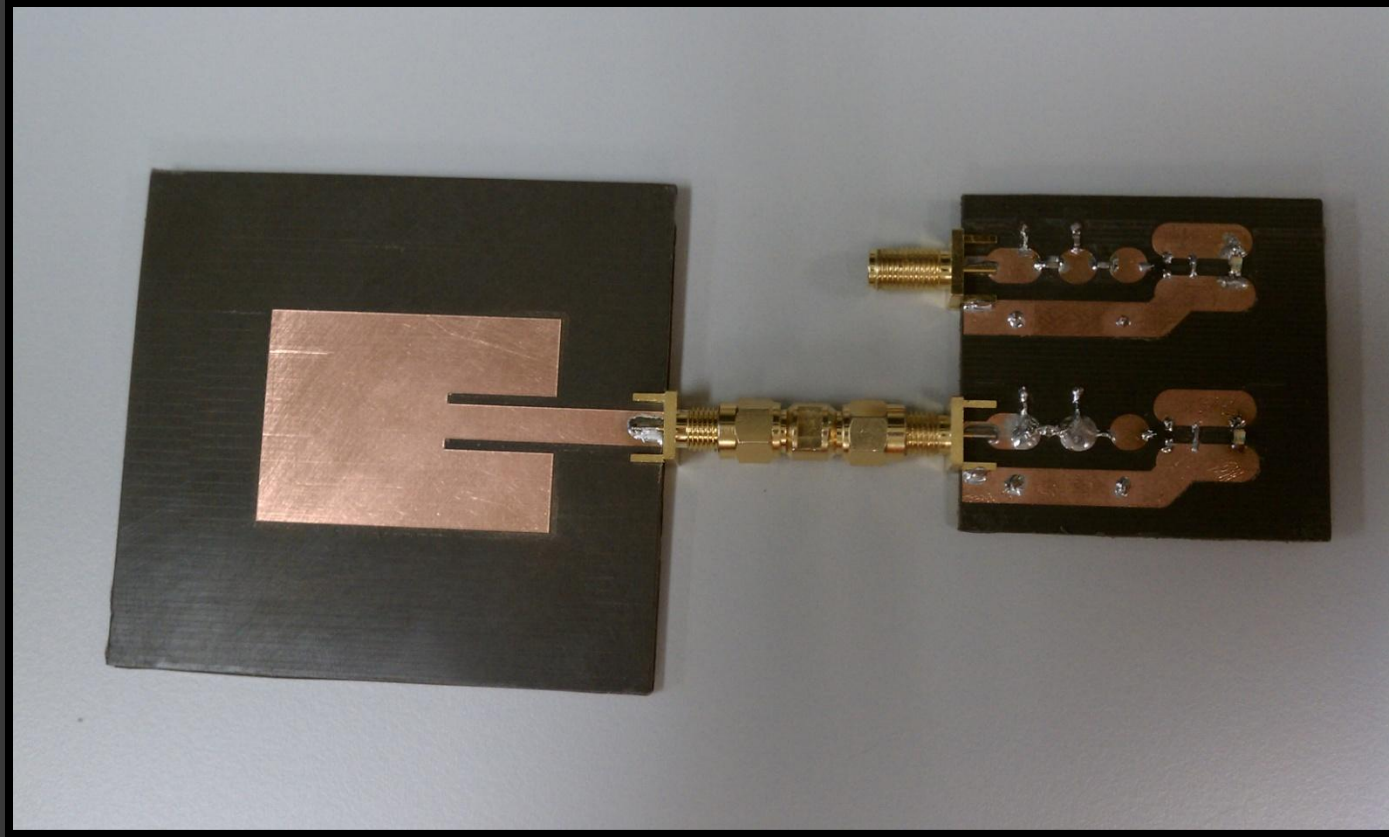
Completed Prototypes



Project Status



Project Status



Project Status

- ⦿ Working PCB Created
 - Matched at 2.45 GHz
 - Harvestable power
- ⦿ Working Lommentenna
 - External antenna
 - Excellent insertion loss at 2.45 GHz

Budget

Part	Quantity	Retail Cost	Expected Cost	Total Cost	Notes
2.4 GHz wireless-G router	1	\$41.99	\$41.99	\$41.99	Ebay
Capacitors (1pF to 150pF)	30 (various sizes)	Various	\$1.40 for all needed caps	\$1.40	Digikey
BAS 40-04 E6327 Schottky Diodes	12	\$0.26	\$0.26	\$3.12	Mouser
Mica 2.4 GHz SMD Antenna	5	\$11.20	\$11.20	\$56.00	Antenova
Components (caps and inductors)	100 (various sizes)	Various	\$40	\$40	Digikey
Duroid 5880	1	N/A	Free	Free	Received from Ben
FR4 Substrate	1	N/A	Free	Free	Received from Ben
Inductors	80	\$0.10	\$8.00	\$8.00	Digikey
			Total	\$201.95	

Summary

- ⦿ Proof of Concept
 - Increased transmit power
 - Scalability for different frequencies
 - Antenna array possibilities
- ⦿ Met the requirements set by Dr Braaten